What is claimed is:

1. A phase angle measuring method for displacement measurement in a two-frequency laser interferometer, which consists of a two-frequency laser interferometer, a 90° phase mixing electronics and a phase angle calculating electronics and performs the steps of mixing a reference signal produced due to an interference of two frequency laser beams and a 90° phase shifted reference signal with a measurement signal for displacement measurement produced due to two frequency laser beams reflected on fixed and moving mirrors, filtering high frequency terms to produce output signals and obtaining a phase angle for displacement measurement, the phase angle measuring method comprising the steps of:

obtaining output signals output from the 90° phase mixing electronics, and ellipse parameters such as amplitudes, offsets and a phase difference included in the output signals; and

applying the same to the following Equation to calculate the phase angle,

$$\theta=\tan^{-1}[\cos\phi/[\sin\phi+(b/a)/(I_x-I_{x0})/(I_y-I_{y0})]]$$

2. A phase angle measuring method for displacement measurement in a two-frequency laser interferometer, which consists of a two-frequency laser interferometer, a 90° phase mixing electronics and a phase angle calculating electronics and

performs the steps of mixing a reference signal filtering high frequency terms to produce output signals and obtaining a phase angle for displacement measurement, the phase angle measuring method comprising the steps of:

obtaining output signals output from the 90° phase mixing electronics, and ellipse parameters, such as amplitudes, offsets and a phase difference included in the output signals which are output from the 90° phase mixing electronics;

applying the ellipse parameters and the output signals to the following Equation to calculate the phase angle;

making out a lookup table with data which consists of the output signals and the phase angle corresponding with them; and

reading the phase angle corresponding with the output signals output from the lookup table when the displacement measurement is required in real application.

$$\theta=\tan^{-1}[\cos\phi/[\sin\phi+(b/a)/(I_x-I_{x0})/(I_y-I_{y0})]]$$

3. A nonlinearity error correcting method for displacement measurement in a two-frequency laser interferometer, which consists of a two-frequency laser interferometer, a 90° phase mixing electronics, a nonlinearity error correcting electronics and a phase calculating electronics and performs the steps of mixing a reference signal produced due to an interference of two-frequency laser beams and a 90° phase shifted reference signal

with a measurement signal for displacement measurement produced due to an interference of two-frequency laser beams reflected on fixed and moving mirrors, filtering high frequency terms to produce output signals, and obtaining a phase angle for displacement measurement, the nonlinearity error correcting method comprising the steps of:

calculating ellipse parameters, such as amplitudes, offsets and a phase difference of output signals which are output from the 90° phase mixing electronics;

calculating adjusting voltages for correcting the output signals and offsets, amplitudes and a phase of the output signals; and

conducting a correction wherein offsets of the output signals output from the nonlinearity error correcting electronics by the adjusting voltages become zero, amplitudes are same, and a phase difference beyond 90° between the output signals becomes zero.

4. A phase angle measuring method for displacement measurement in a two-frequency laser interferometer, which consists of a two-frequency laser interferometer, a 90° phase mixing electronics, a nonlinearity error correcting electronics and a phase calculating electronics and performs the steps of mixing a reference signal produced due to an interference of two-

frequency laser beams and a 90° phase shifted reference signal with a measurement signal for displacement measurement produced due to an interference of two-frequency laser beams reflected on fixed and moving mirrors, filtering high frequency terms to produce output signals, and obtaining a phase angle for displacement measurement, the phase angle measuring method comprising the steps of:

calculating ellipse parameters, such as amplitudes, offsets and a phase difference of the output signals which are output from the nonlinearity error correcting electronics;

calculating adjusting voltages for correcting the output signals and offsets, amplitudes and a phase of the output signals;

conducting a correction wherein offsets of the output signals output from the nonlinearity error correcting electronics due to the adjusting voltages become zero, amplitudes are same, and a difference beyond 90° between the output signals becomes zero; and

applying the output signals whose offsets, amplitudes and phase are corrected to the following Equation to calculate the phase angle,

$$\theta = \arctan(I_y/I_x).$$

. A phase angle measuring system for displacement measurement in a two-frequency laser interferometer, the phase angle measuring system comprising:

a two-frequency laser interferometer which outputs a reference signal produced due to an interference of two frequency laser beams and a measurement signal for displacement measurement produced due to an interference of two frequency laser beams reflected on fixed and moving mirrors;

a 90° phase mixing electronics which mixes the reference signal and a 90° phase shifted reference signal with the measurement signal output from the interferometer, filters high frequency terms and outputs output signals for phase angle measurement;

a nonlinearity error correcting electronics which receives again the output signals output from the nonlinearity error correcting electronics, obtains ellipse parameters such as amplitudes, offsets and a difference from phase-quadrature of the output signals, calculates adjusting voltages for correcting the amplitudes and the offsets of the output signals, and conducts a correction wherein offsets of the output signals become zero due to calculated adjusting voltages, amplitudes are same and a phase difference beyond 90° between the output signals becomes zero; and

a phase angle calculating electronics which obtains a phase angle by applying the output signals output from the nonlinearity error correcting electronics to the following Equation $\theta = \arctan(I_y'/I_x')$.

6. The phase angle measuring system of claim 5, wherein the interferometer includes:

a laser which emits two orthogonally linear-polarized beams which have different frequencies;

a beamsplitter which splits the laser into a measurement beam incident to a polarizing beamsplitter and a reference beam incident to a photodetector through a polarizer;

the photodetector which detects a reference signal as an interference signal of the two laser beams from the reference beam of the photodetector and provides the same to a first mixer and a 90° phase shifter;

the polarizing beamsplitter which splits the laser beam transmitted from the beamsplitter into two beams incident to a fixed mirror and a moving mirror, mixes two laser beams reflected from two mirrors; and

the photodetector which detects a measurement signal as an interference signal of the two laser beams from the measurement beam of the polarizing beamsplitter and provides the same to the first mixer and a second mixer.

7. The phase angle measuring system of claim 5, wherein the 90° phase mixing electronics includes:

a 90° phase shifter which 90° phase shifts the reference signal provided from a photodetector and provides the same to a second mixer;

a first mixer which mixes the reference signal output from the photodetector with the measurement signal output from the photodetector;

the second mixer which mixes 90° phase shifted reference signal through the 90° phase shifter with the measurement signal output from the photodetector; and

low pass filters which filter high frequency terms from the output signals output from the mixers and provides the same to offset adjustment means.

8. The phase angle measuring system of claim 5, wherein the nonlinearity error correcting electronics includes:

a microprocessor which obtains ellipse parameters such as amplitudes, offsets and a phase difference of output signals fed back from the nonlinearity error correcting electronics through an analogue-to-digital converter and calculates adjusting voltages for correcting the amplitudes, the offsets and the phase of the output signals;

offset adjustment means which conducts a correction wherein offsets of output signals fed back from the nonlinearity error correcting electronics due to the adjusting voltages output from the microprocessor through a digital-to-analogue converter become zero;

amplitude adjustment means which conduct a correction wherein amplitudes of the output signals fed back through the nonlinearity error correcting electronics by the adjusting voltages output from the microprocessor through the digital-to-analogue converter are same; and

phase adjustment means which conducts a correction wherein a phase value in excess of 90° between the output signals fed back through the nonlinearity error correcting electronics by the adjusting voltages output from the microprocessor through the digital-to-analogue converter becomes zero.

9. The phase angle measuring system of claim 5 or claim 8, wherein the offset adjustment means, the amplitude adjustment means and the phase adjustment means of the nonlinearity error correcting electronics can be arranged in a free order.